



**Bundesstelle für Seeunfalluntersuchung**  
**Federal Bureau of Maritime Casualty Investigation**  
Federal Higher Authority subordinated to the Ministry of Transport,  
Building and Urban Affairs

## **Summary Investigation Report 617/08**

**Serious Marine Casualty**

**Collision of the cargo ship FREYA  
with the Gelbsand front light structure  
in the Elbe approach  
on 16 December 2008**

The investigation was conducted in conformity with the law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Law - SUG) of 16 June 2002.

According to this the sole objective of the investigation is to prevent future accidents and malfunctions. The investigation does not serve to ascertain fault, liability or claims.

The present report should not be used in court proceedings or proceedings of the Maritime Board. Reference is made to Art. 19 Para. 4 SUG.

The German text shall prevail in the interpretation of the Investigation Report.

Issued by:  
Bundesstelle für Seeunfalluntersuchung - BSU  
(Federal Bureau of Maritime Casualty Investigation)  
Bernhard-Nocht-Str. 78  
20359 Hamburg  
Germany

Head: Jörg Kaufmann  
Phone: +49 40 31908300  
posteingang-bsu@bsh.de

Fax: +49 40 31908340  
[www.bsu-bund.de](http://www.bsu-bund.de)

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## **1 Summary of the marine casualty**

On the evening of 16 December 2008, the Dutch cargo ship FREYA put out of the Hamburg port heading to sea. The next port of call was Oslo / Norway. The ship's command and an apprentice were on the bridge, both citizens of the Netherlands. The FREYA was exempt from the obligation to accept a pilot. Navigation was on the basis of the nautical paper chart; the electronic nautical chart was not in operation. The ship was operated in the autopilot mode. The two radar systems were operated in North up, relative mode.

The weather conditions were good. The wind blew from the south at 3 Bft and it was cloudy, but there was no rainfall. As the FREYA reached the Elbe approach at 2200, there was an ebb stream of about 2 kts. The voyage speed of FREYA was 18 kts over ground.

As the FREYA passed the light buoy 24 at the location of Gelbsand, preparations were made for the next course alteration to port. At this moment a lighted cardinal buoy had been spotted for the first time on the portside ahead. The buoy was one of two south-cardinal buoys that secured a construction area for building the Gelbsand leading light outside the fairway at the location of the light buoy 22. A restricted area had been set up around the construction area. FREYA's command did not see any indication of the construction area on the nautical chart, because the corresponding official chart correction was not yet available on board.

FREYA was called by the Vessel Traffic Service (VTS) Cuxhaven using VHF and was requested to execute a "hard to port" manoeuvre. At the conning position on the bridge, a switchover to manual control was then made, the rate of speed reduced and a "hard to port" executed. Meanwhile, the VTS made further calls. At 2216 the FREYA collided with the front light structure. The cargo ship was severely damaged. Water entered the forepeak. Nevertheless, the ship was able to anchor in the Neuwerk roads without needing any support.

Nobody was injured and no substances hazardous to the environment were released due to this marine accident.

## 2 Scene of the accident

Type of the event: Serious marine casualty, collision  
 Date/Time: 16 December 2008, 2216  
 Location: Gelbsand front light, Elbe approach  
 Latitude/Longitude:  $\varphi$  53°58.25'N  $\lambda$  008°37.8'E

Section from nautical chart 44, German Federal Maritime and Hydrographic Agency

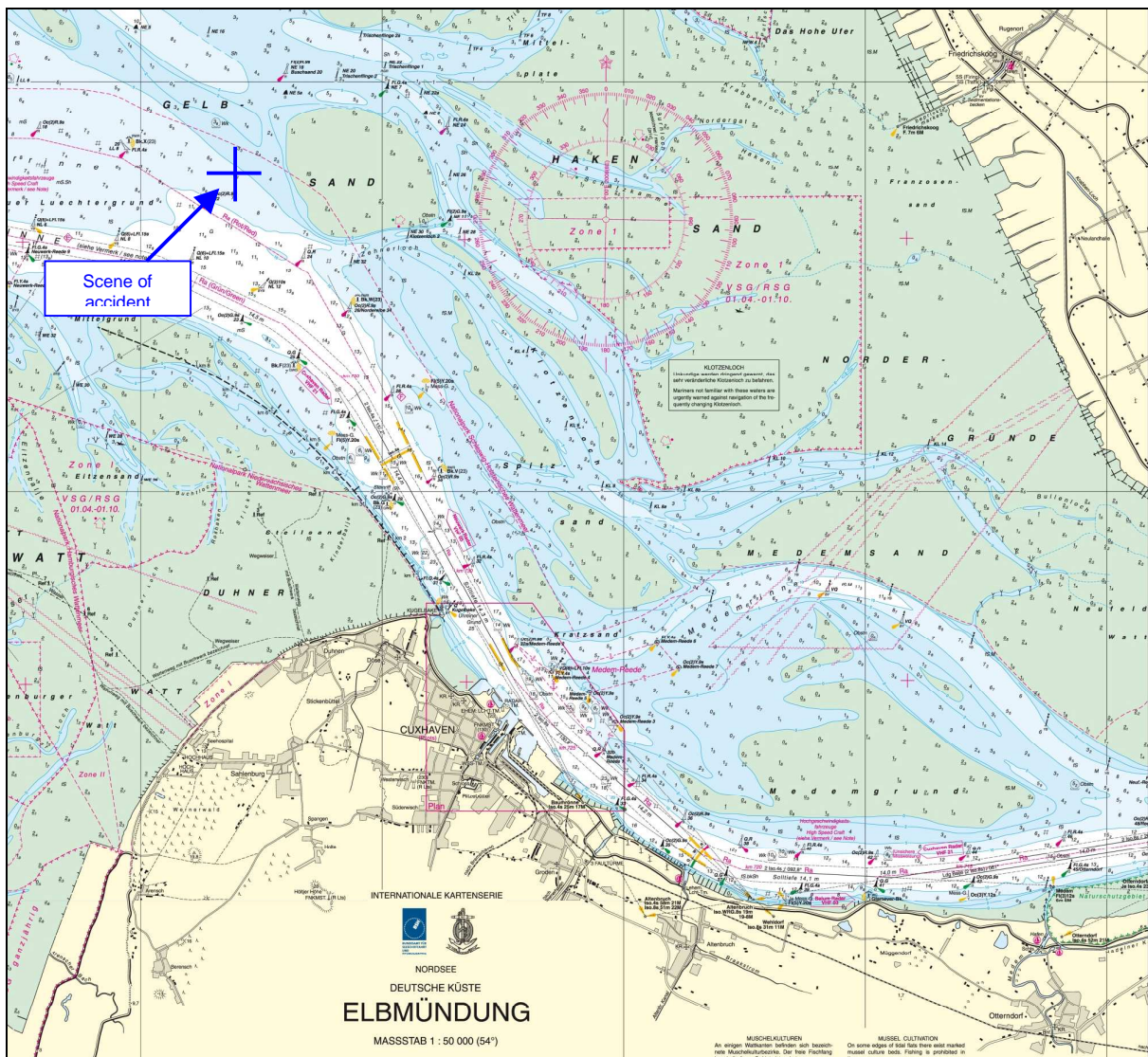


Figure 1: Nautical chart

### 3 Vessel particulars

#### 3.1 Photo



© Hasenpusch Photo-Productions and Agency

#### 3.2 Particulars

Name of the vessel:	FREYA
Type of vessel:	Cargo ship
Nationality/flag:	Netherlands
Port of registry:	Heerenveen
IMO number:	9219874
Call sign:	PECN
Owner:	Scheepvaartonderneming Freya C.V
Vessel operator:	Holwerda Shipmanagement B.V.
Year built:	2000
Shipyard/Yard number:	J.J. Sietas KG Schiffswerft GmbH & Co. / 1158
Classification society:	Germanischer Lloyd AG
Length overall:	117.90 m
Breadth overall:	17.90 m
Gross tonnage:	5,067
Deadweight:	6,850 t
Draught at time of accident:	fore: 5.95 m, aft: 6.00 m
Engine rating:	5,995 kW
Main engine:	MAK 8 M 43
Speed:	18 kts
Hull material:	Steel
Number of crew:	12



### **3.3 Vessel equipment and manoeuvring characteristics**

The main engine of FREYA is a four-stroke MAK 8M 43 diesel engine (300 nominal rpm) with a power rating of 5,995 kW. The main propulsion system includes two caterpillar auxiliary diesel engines of type 3412, each having an output of 534 kW. The cargo ship has a bow thruster of 550 kW output. Propulsion is generated by means of a controllable pitch propeller that rotates clockwise.

The bridge equipment includes two radar systems (S-band and X-band), one electronic chart system (ECS) and one Simplified Voyage Data Recorder (S-VDR).

According to the wheelhouse poster on the bridge, the FREYA requires 41 seconds for an emergency stop manoeuvre from “full ahead” to “full astern”. The maximum rudder angle of the semi-balanced rudder is 45°.



## 4 Course of the accident and investigation

### 4.1 Accident

On the evening of 16 December 2008, the Dutch cargo ship FREYA put out of the Hamburg port heading to sea. The next port of call was Oslo / Norway. The ship's command and an apprentice were on the bridge, both citizens of the Netherlands. The ship's command had boarded in Hamburg. He was exempt from the obligation to accept a pilot. Navigation was on the basis of the nautical paper chart; the electronic nautical chart was not in operation. The ship was operated in the autopilot mode. The two radar systems were operated in North up, relative mode.

The weather conditions were good. The wind blew from the south at 3 Bft and it was cloudy, but there was no rainfall. As the FREYA reached the Elbe approach at 2200, there was an ebb stream of about 2 kts. The voyage speed of FREYA was 18 kts over ground.

As the FREYA passed the light buoy 24 at the location of Gelbsand, preparations were made for the next course alteration to port. At this moment a lighted cardinal buoy had been spotted for the first time on the portside ahead. The buoy was one of two south-cardinal buoys that secured a construction area for building the Gelbsand leading light outside the fairway at the location of the light buoy 22. A restricted area had been set up around the construction area. FREYA's command did not see any indication of the construction area on the nautical chart, because the corresponding official chart correction was not yet available on board.

At Cuxhaven VTS, it was observed how the FREYA passed fairway buoy 24 southerly, but did not undertake the necessary course alteration to port. The vessel was therefore called by the nautical supervisor (NvD) at Cuxhaven VTS by VHF and was requested to execute a "hard to port" manoeuvre so as to return to the fairway. At the conning position on the bridge of the FREYA, a switchover to manual control was then made, the rate of speed was reduced and a "hard to port" was executed. Meanwhile, the VTS made further calls. At 22:16h the FREYA collided with the guiding frame and the shaft of the front light structure.

Alcohol consumption by the ship's command as the cause of the accident was ruled out.

### 4.2 Damages

The cargo ship and the front range structure were severely damaged following the collision.

#### 4.2.1 FREYA

The impact tore several holes in the bow of the FREYA, one each above the waterline to port and to starboard (cf. Figures 3 to 5) as well as one bulbous bow just below the waterline (cf. Figure 6). Seawater filled the forepeak through the latter hole. Besides, there were extensive abrasions of the shell plating on both sides due to which frames were deformed partially.



Figure 3: Damaged starboard side of the FREYA

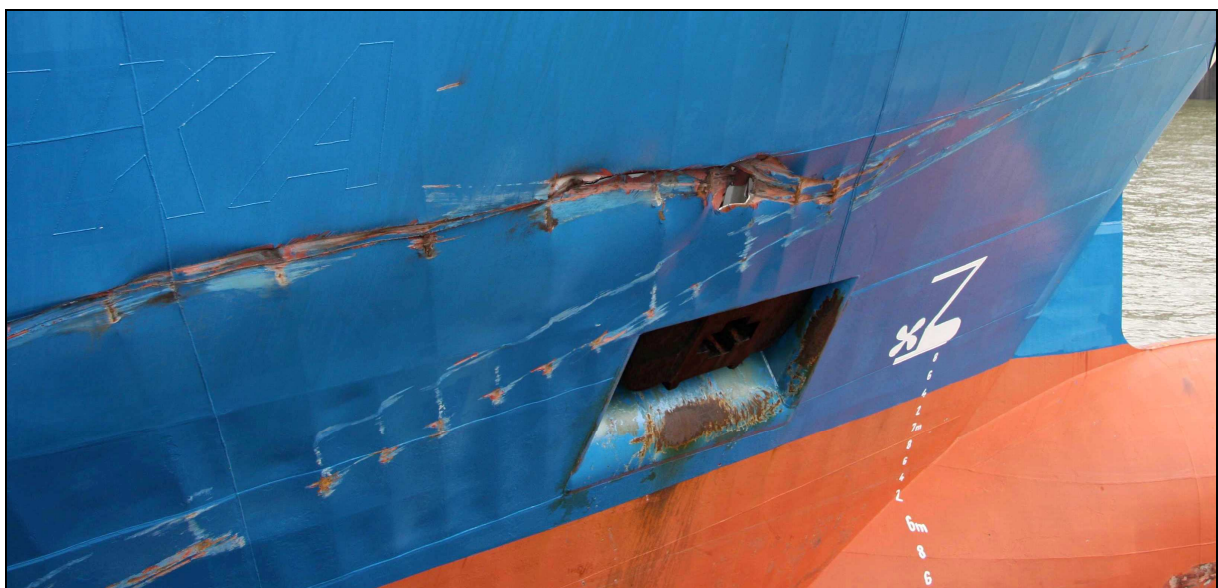


Figure 4: Details of the damage to the starboard side of the FREYA



Figure 5: Damaged port side of the FREYA

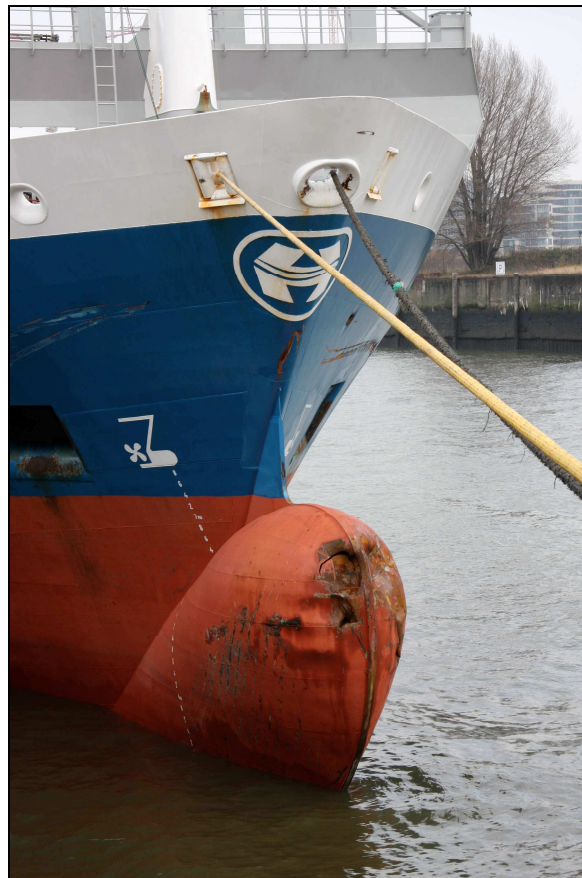


Figure 6: Damaged bulbous bow of the FREYA



Even the rolling-chock and frames at the underwater hull were severely deformed due to the collision and torn apart to some extent (cf. Figure 7).



Figure 7: Damaged underwater hull of the FREYA

#### 4.2.2 Front light structure

The FREYA also tore the guiding framework and the shank (diameter: 3 m) of the front range light being erected. Only one guide mooring post of the structure still protruded out of the water after the collision (compare Figure 8).

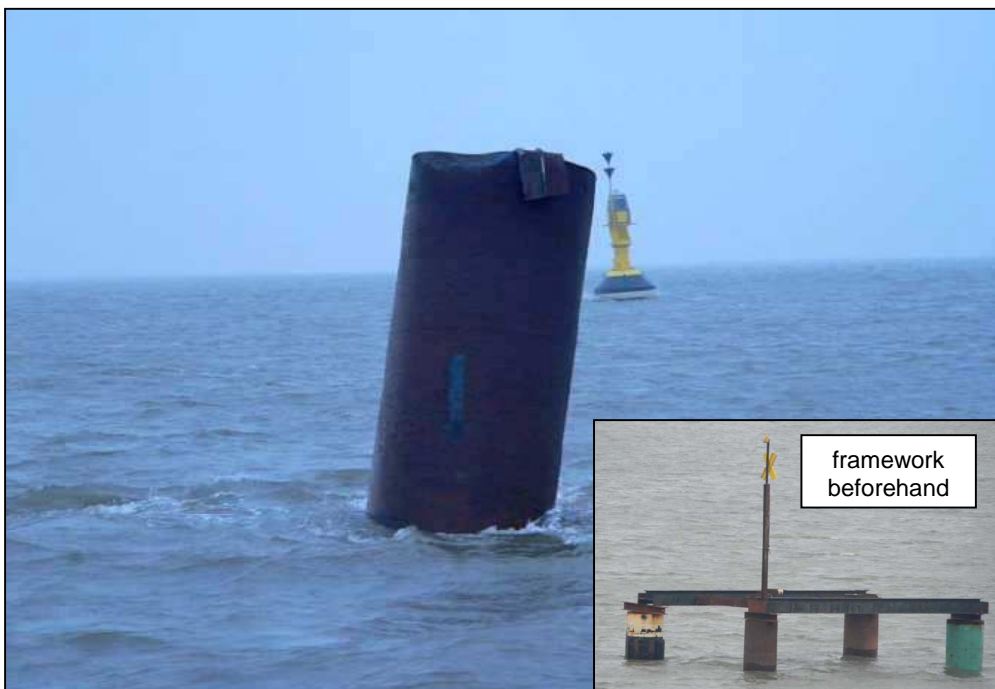


Figure 8: Damaged dolphin of the guiding framework

The VWFS ATAIR<sup>1</sup> of the Federal Maritime and Hydrographic Agency (BSH) could localize the wreckage components of the front light structure on 18 December 2008 with the help of a side scan. The wreckage (cf. Figure 9) stretched to an area of approximately 20 x 50 m. The maritime salvage operations of the wreckage debris lasted till 2 February 2009. Construction activities at the Gelbsand front light structure could be resumed only there after.

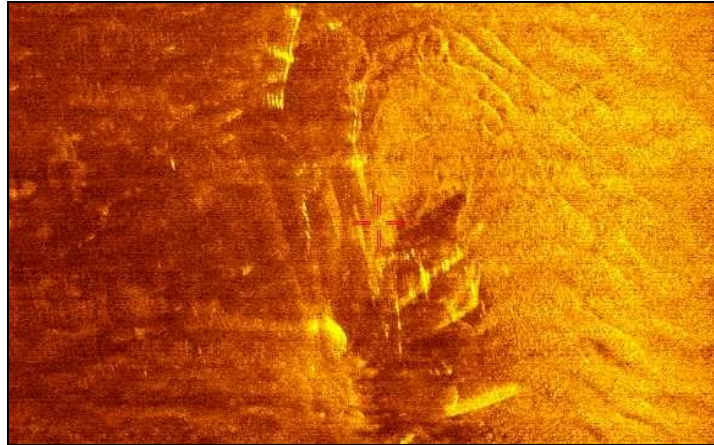


Figure 9: Side scan of the wreckage

#### 4.3 Survey of the FREYA by BSU

Employees of the Federal Bureau of Maritime Casualty Investigation (BSU) surveyed the FREYA on 18 December 2008 in Hamburg. The ship certificates and documents relevant to the maritime casualty investigation were examined and copied on the bridge (cf. Figure 10). The bridge crew of the day of the accident was available to the investigation team for interviews.



Figure 10: Wheel house of the FREYA

<sup>1</sup> Multi-purpose vessel



The BSU documented the damages to the underwater hull on 19 December 2008, when the FREYA lay in the dry dock for repairs.

#### 4.4 Evaluation by the BSU

For the accident investigation, the BSU received information from the Cuxhaven Water and Shipping Authority (WSA) and the BSH in addition to the documents provided by the shipping company, the Cuxhaven Waterways Police (WSP) and the Cuxhaven VTS.

##### 4.4.1 Voyage Data Recorder (S-VDR)

The control panel of the S-VDR is integrated in the console next to the conning position (cf. Figure 11).



Figure 11: S-VDR control panel in the bridge console

A backup is triggered basically by pressing the two “SAVE” buttons, left and right, at the bottom of the control panel. The stored data can then be selected and called via a data connection with the main unit of the S-VDR, which is also located on the bridge.

The S-VDR has a recording capacity of maximum three backups. As soon as all three backup save opportunities are full, at least one of the stored events must be deleted manually before the next backup can be executed. After the BSU employees arrived on board, it turned out that all three backup opportunities were occupied with

events that had taken place before the accident, so that the data of 16 December 2008 had not been secured (cf. Figure 12<sup>2</sup>).

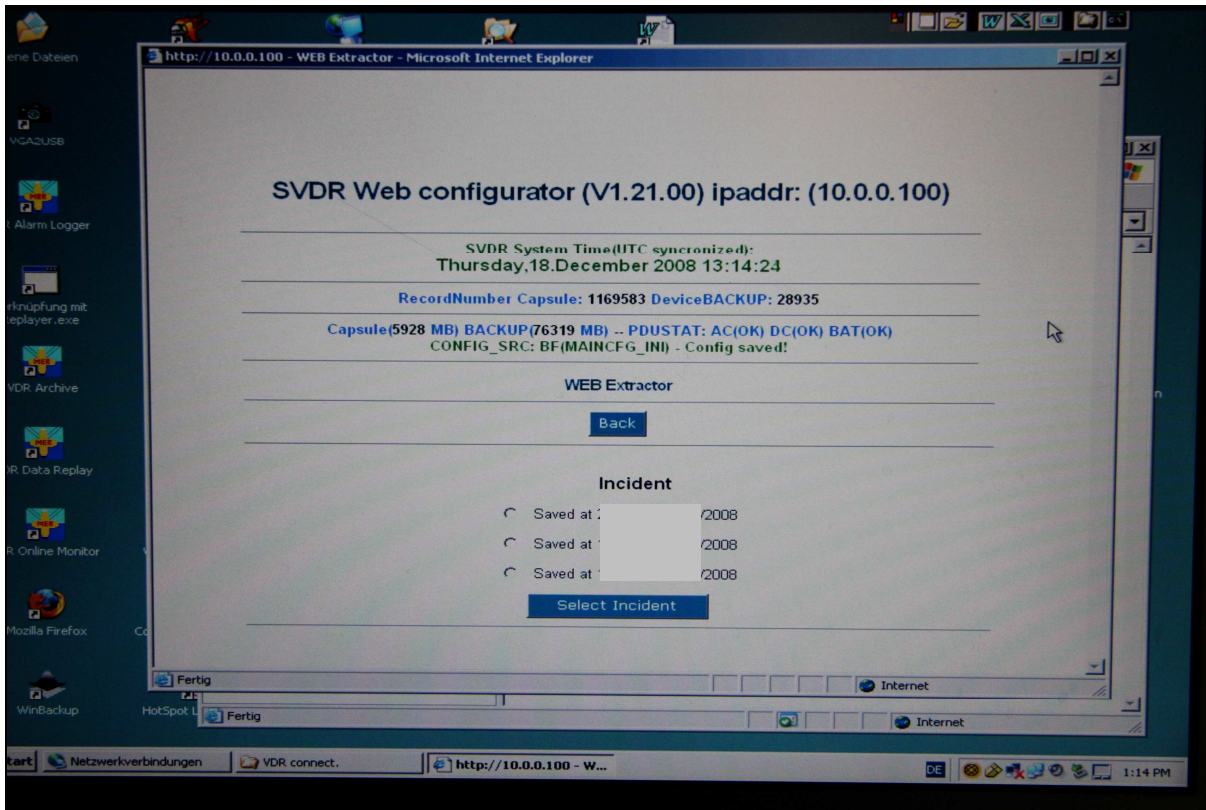


Figure 12: Storage menu of the S-VDR for three full backups

If a backup is conducted with all the backup save opportunities occupied, a corresponding message is displayed on the screen of the control panel, and the “SAVE” LED lights up in red in the steady mode (cf. Figure. 13).



Figure 13: Message display on the S-VDR screen

<sup>2</sup> Camouflaging of the saved data before the accident by the BSU.



The ship's command was aware of the functioning of the S-VDR backup system.

The manual of the manufacturer of S-VDRs refers expressly to the limited backup opportunities and their consequences:

„3.1.2 Means for initiating a backup

The VDR system is only guaranteed to record data for 12 hours i.e. important data may be overwritten after twelve hours unless a backup of data is made following an incident.

(...)

The system is capable of storing three incidents. The “Save” LED indicates when there is one or no save opportunity left (disk full). A backup will be protected for 30 days after which the space of the disc will be released automatically. This backup disc must be replaced if it becomes full (which is unlikely under normal circumstances). Alternatively, data from the disc must be transferred to another media and space on the disc can be manually released. This requires proper authorization and cannot be done from the BAU (Bridge Alarm Unit).”

The authorization required for the manual deletion of a backup entry is obtained by inputting a password. The required password was known to the ship's command.

As all the three backup opportunities were occupied at the time of the accident, and the backup disk was not manually cleared within 12 hours to enable recording of the accident in retrospect, no S-VDR recordings were available to BSU for investigating the collision.

**4.4.2 Recordings of the Cuxhaven VTS**

The Cuxhaven VTS provided a radar image containing the course of the voyage of the FREYA, VHF recordings of Channel 71 as well as a voyage table determined by the radar data for the accident investigation.

**4.4.2.1 Voyage table**

The voyage table of the Cuxhaven VTS for the FREYA indicates the following courses and speeds during the course of the voyage:

Time	Course (in °)	Speed over ground (in kts)
22:00:01	328	17.3
22:01:01	333	19.5
22:02:01	332	19.1
22:03:02	331	19.1
22:03:58	332	19.5
22:04:54	331	19.3
22:05:50	331	19.1
22:06:50	331	18.8
22:07:51	331	19.0
22:08:51	330	18.9

(Continued)		
Time	Course (in °)	Speed over ground (in kts)
22:09:51	330	18.8
22:10:47	329	18.7
22:11:51	329	18.4
22:12:48	329	18.1
22:13:48	327	17.9
22:14:48	328	17.8
22:15:48	327	17.4
22:16:48	318	3.3
22:17:52	308	3.3
22:18:52	308	3.3
22:19:52	300	3.7
(...)		

Table 1: Voyage table of the FREYA

#### 4.4.2.2 Radar image

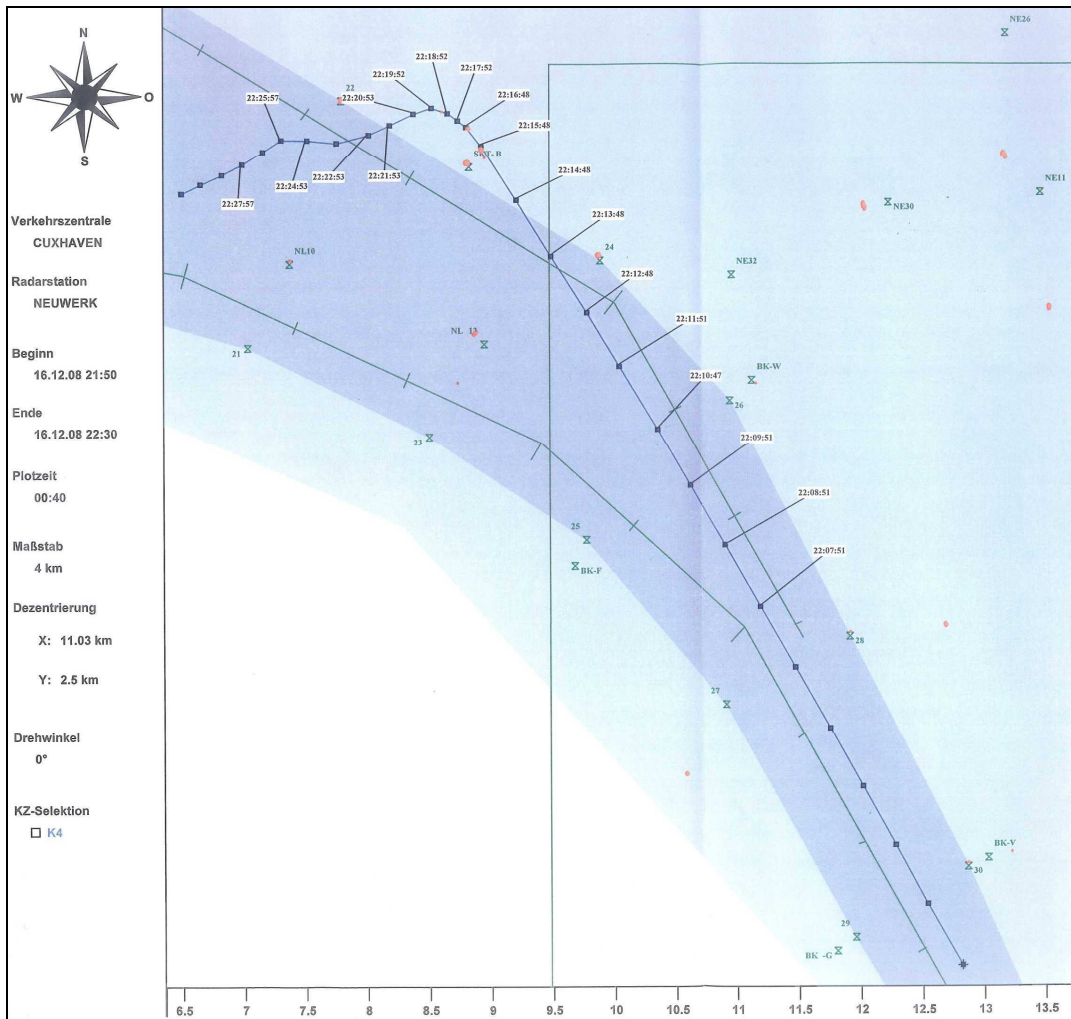


Figure 14: Radar image containing voyage course of the FREYA

It is clear from the voyage table as well as the radar image that even after passing buoy 24 at 2213, the FREYA initially maintained her speed of approximately 18 kts almost unchanged. The sudden drop in speed from 17.4 kts to 3.3 kts at the time of the accident (2216) is significant. The original course of exactly 330° was maintained almost right up to the collision.

#### 4.4.2.3 VHF recordings

The VHF recordings of the Cuxhaven VTS of Channel 71 were transcribed and translated from German to English by the BSU. The first calling of the FREYA by Cuxhaven Elbe Traffic (CT) took place one minute prior to the collision:

CT           FREYA, Cuxhaven Traffic.  
FREYA       Cuxhaven Traffic, FREYA.

CT           Yes, you are heading towards... uh... buoy... uh towards the... yes the new uh leading light, the... the front light. You are slowly leaving the fairway. You now are between 22 and 24, yes?

FREYA       22, 24.

CT           Yes, you have to come hard to port. You are totally... You are leaving the fairway. Hard to port. You now have a buoy directly ahead.

(no reaction for 12 s)

CT           FREYA, did you realise that?

FREYA       I realised that.

CT           Yes, do you have unimpaired view, do you see that?

(no reaction for 7 s)

FREYA, you have to come to port. Hard to port.

FREYA       Hard to port.

(no reaction for 22 s)

[other ship] Yes, is pretty much up in the north.

CT           FREYA, Cuxhaven Traffic.

FREYA       Cuxhaven Traffic, we are uh... grounded.

CT           You are grounded, you had a collision there, is that correct?

FREYA       That is correct.

CT           So, FREYA, can you see any damages?

FREYA       What did you say?

CT           Can you determine any damages?

(no reaction for 15 s)

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CT The BÜRGERMEISTER BRAUER, Cuxhaven Traffic.  
BB Yes, we heard that, we turn about, we head there.  
CT All right, thanks.

CT FREYA, Cuxhaven Traffic.  
FREYA Yes Cuxhaven Traffic.  
CT Yes, can you determine any major damages on your ship? Can you still manoeuvre?  
FREYA At the moment we are grounded, uh, I turn [not understandable] after the red buoy.

[other ship] I can see it slightly moves, uh here is [ship's name].  
CT Yes, all right.  
[other ship] He is now proceeding ahead.

CT FREYA, Cuxhaven Traffic.  
FREYA Yes Cuxhaven Traffic for FREYA.  
CT Yes, you can come more southerly now. Do you see buoy 22?  
FREYA Yes, I come southerly, yes.

It is clear from the recordings that the Cuxhaven VTS responded promptly with manoeuvre instructions to the FREYA as soon as the leave from the fairway was displayed on the radar. During the VHF communication, the Standard Marine Communication Phrases of the International Maritime Organization (IMO) were not adhered to. However, these are not binding for the use of the German language. In the end, the participants had too little time to prevent the collision due to the small distance of buoys 24 and 22 of just 1.5 nm.

#### 4.4.3 Voyage plan of the FREYA

The tabular voyage plan done by the 2nd Nautical Officer contains only the stretch from pilot to pilot, starting with the "Elbe1" buoy and therefore, westerly of the accident position. For the coastal operation however, courses were entered in the nautical paper chart BA 3619. According to this plan, a course alteration was originally scheduled at the height of buoy 24 from 331° to 300° to port (cf. Figure 15). The voyage table determined by the Cuxhaven VTS for the FREYA and the voyage course determined according to the radar image prove that the planned course alteration at the provided waypoint had not taken place. Whether and at what intervals the ship positions were determined on the bridge is not known by the BSU. The last entry in the bridge logbook was made on the evening of the accident at 2029.

The route planning according to the nautical paper chart mostly followed the leading line displayed in the chart. This caused a problem because the chart had not been updated and hence it did not indicate the front light construction area as well as the restricted area.



Ref.: 617/08

The electronic chart was not in operation on the day of the accident, so that the bridge team did not have the option of comparing the information on the paper chart to that of the digital chart. To what extent the electronic chart was available and updated at the time of the route planning could not be clarified by the BSU with certainty. It is also not known to what extent the Cuxhaven VTS separately informed about the construction area in its regular situational reports over VHF.

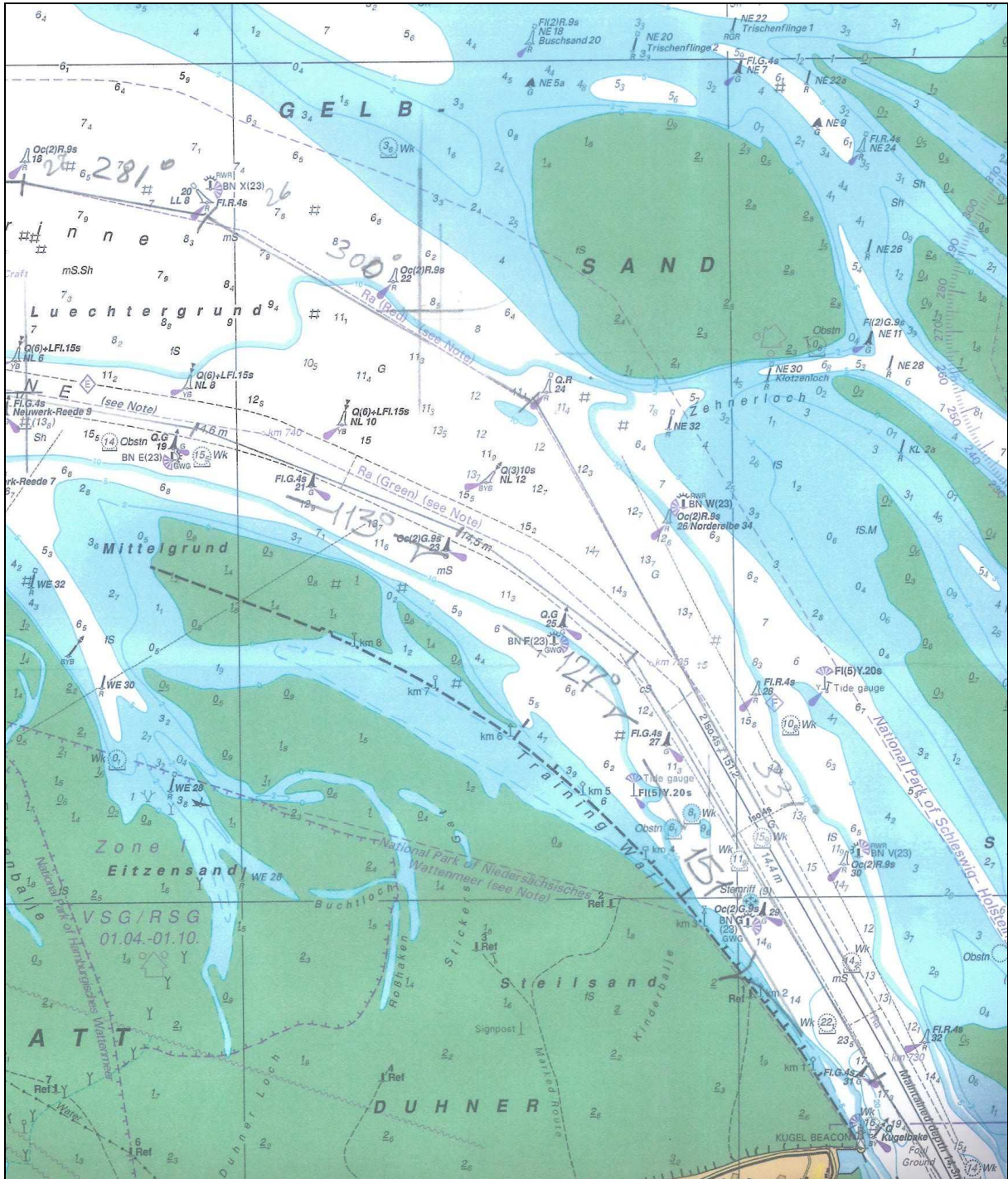


Figure 15: Chart section BA 3619 with the entered courses of the FREYA

#### 4.4.4 Chart revisions

On the day of the accident, the FREYA was being navigated on the basis of the official British Admiralty nautical paper chart BA 3619. The chart was purchased in October 2008 from a licensed dealer based on revision status 45<sup>th</sup> delivery, and was corrected on board to the revision status of the 47<sup>th</sup> delivery. The corrections were documented accordingly.

The Cuxhaven Water and Shipping Authority responsible for the construction activities associated with the Gelbsand front light had issued public notifications for sailors (BfS) on the 8 October 2008 about shipping restrictions on account of the construction activities.

Extracts from the BfS read as follows:

“A new leading light called Gelbsand is being built in the region northerly of the Elbe fairway below and above buoy 22.

Starting on 08.10.2008, depending upon the weather, foundation work is being carried out involving the installation of steel structures for building the rear range and front lights in the area outside the fairway, below and above buoy 22.

To secure the construction, yellow/black south cardinal buoys with marks VQ (6) + LFI have been placed at the following positions:

- a) 53°59.0500' N 008°36.6500' E – abeam the future rear light
- b) 53°58.2666' N 008°37.4000' E – abeam the future front light

The construction protrudes only about 1 m above the water level at MHW and is marked with a yellow 360° light.

To secure these structures, a restricted area has been setup between the two south cardinal buoys abeam to Gelbsand.

Shipping and fishing vessels are requested to take care.”

Consequently, notification about the construction area between buoys 24 and 22 also later appeared in the Nachrichten für Seefahrer (German Notices to Mariners, NfS, edition 43/08). In general, the changes that also concern the official British charts like the BA 3619, are published within a few weeks in the official British publication, Notices to Mariners (NM), and made public to the shipping sector. After the publication of the NfS or the NM, it generally takes differing lengths of time until the printed editions of the relevant official publication reach the ships by post in a port.

In the case of the construction area around the Gelbsand front light, the German NfS containing the building area instructions was published on 24 October 2008 (43/08 edition). The corresponding NM appeared but six weeks later, on 4 December 2008 (49/08 edition). It reached the FREYA by post and was available on board on 17 December 2008, one day after the collision.



Ref.: 617/08

If the correction instructions had been available on the day of the accident, the absolutely essential adjustment of that days voyage planning would have been evident (cf. Figure 16).

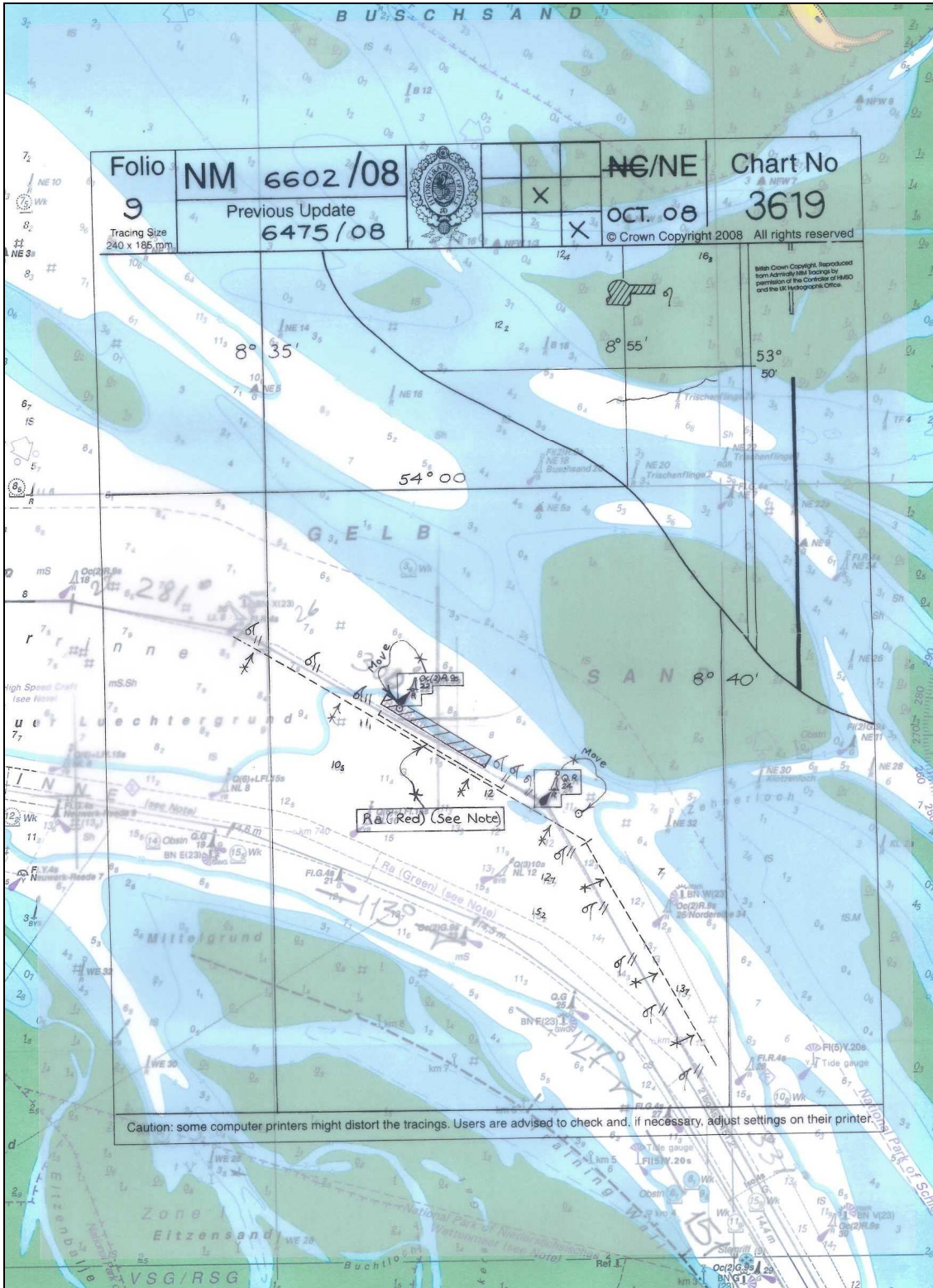


Figure 16: Section from Chart BA 3619 containing the courses of the FREYA and correction sheet of the Notices for Mariners 6602/08



## **5 Conclusion**

The voyage plan of the FREYA led through an area between the buoys 24 and 22 which was restricted for shipping traffic due to construction activity for the Gelbsand front light. The corresponding official revision for the British nautical paper chart, which ought have called for an adjusted routeing, became available on board only after the accident.

As the bridge crew viewed a lighted cardinal buoy between buoys 24 and 22, very little time was left for an emergency evading manoeuvre. Finally, neither the avoiding action nor the prompt instructions of the Cuxhaven VTS could prevent the collision.

The accident investigation could not explain why the bridge crew of the FREYA viewed only one of the two lighted south cardinal buoys. In the end, FREYA rammed directly into the construction framework which was marked additionally with a yellow 360° light.

## 6 Sources

- Statements of the bridge crew
- Crew list
- Extracts from the bridge log book and the port log book
- Voyage plan
- Watch schedule for the bridge crew
- Time sheet of the Master
- Pilot card
- S-VDR displays and manual
- Documentation of the chart corrections
- Documents and certificates: Type examination certificate for the S-VDR, Cargo Ship Safety Certificate, ISM Document of Compliance
- Pilotage Exemption Certificate of the WSA Hamburg
- BSU-questionnaire filled up by the ship operator
- Surveys of the FREYA by the BSU
- Findings of the Waterway Police (WSPK4)
- Recordings of the Cuxhaven Vessel Traffic Service (radar and VHF)
- Information of the Cuxhaven Water and Shipping Authority
- Nautical chart BA 3619
- Revisions of chart BA 3619